

CHARLES UNIVERSITY

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Facial nerve paresis

Bachelor thesis

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Declaration

I declare that my Bachelor thesis is based entirely on my own individual work, and on my practice at Fakultní nemocnice Královské Vinohrady, Neurological department in Prague from 09.02.09 to 20.02.09.

By reading several books, journals and information found on the Internet, I gained knowledge regarding this subject.

The list of sources I have used to compose my work is found in my literature list.

Prague, April 2009

Klára Grue
.....

Acknowledgement

I would like to thank my dear family for being supporting, thoughtful and incredible helpful during my education here in Prague. Without them it would not be possible to accomplish the studies abroad. Also a special thanks to my dear school friends at FTVS and all my good friends home in Norway.

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1. Abstract

Title: Facial nerve paresis

Thesis aim: In my Bachelor thesis I discuss about facial nerve paresis. There is a general part with the anatomy and function of facial nerve and surroundings, then the facial nerve injuries and paralysis is discussed, both peripheral and central paresis. Then the different diagnoses that can occur from facial nerve paresis are mentioned. And at the end the therapy applied for facial nerve paresis and contraindications.

The special part consists of the data collected under my two weeks of practise at the neurological department in Vinohrady. Here I had a patient with peripheral facial nerve paresis, which I followed for 8 days. The result is concluded from these 8 days with therapy applied on the patient.

Clinical findings: The patient is a 38 year old male. He works as a truck driver and travels a lot. This is his 2nd peripheral nerve paresis within 3 years.

Methods: The therapy included 8 sessions during two weeks, one session each day, performed between 8 and 10 in the morning. The sessions typically included strengthening, relaxation and stretching and various other physiotherapeutic approaches of his whole face.

Result: The patient improved slightly during the two weeks, and showed trace of progression in the muscle contraction, and the closing of the eye was a big problem for him and he had an opening in 5 mm when I started and it decreased to 2-3 mm.

Key words: Peripheral facial paresis, Physiotherapy applied to his face particularly for the paretic right side affecting speech, eating and his drinking abilities.

2. Preface

The Bachelor thesis is divided into two parts, the general and the special part.

In the general part I discuss theoretically about the diagnosis, involving signs and symptoms, course of the syndrome, treatment and the prognosis.

As a start, I begin to explain the anatomy of the head and neck, which includes the musculoskeletal and nervous system. I continue going more specific into the facial nerve anatomy, physiology and function. Then the facial nerves injuries and paralysis and the difference between central and peripheral paresis. Then specific into different diagnosis the facial nerve paralysis can make. At last the therapies used in Bell's palsy.

The special part includes the anamnesis, initial kinesiological and the final kinesiological examination, with all its belongings. Further on is the conclusion of findings, rehabilitation plan and applied therapy, evaluation and prognosis.

3 General part

3.1. Anatomy of the head and neck

To understand the structure and function of head and neck in human body its important to know the anatomy of it, that includes the brain, blood vessels, nerves, glands, nose, mouth, teeth, tongue, throat and the bones and muscles in the musculoskeletal system.

Musculoskeletal system:

The bones

The head is positioned upon the superior portion of the vertebral column, attaching the skull upon C-1, (the atlas). The skeletal section of the head and neck forms the superior segment of the axial skeleton and comprises skull, hyoid bone, auditory ossicles, and cervical spine. The skull is subdivided into: cranium and facial bones. Cranium is divided into: frontal bone, 2 parietal bones, and occipital bone, 2 temporal bones, sphenoid and ethmoid bone. Facial bones are: 2 zygomatic bones, 2 maxillary bones, 2 palatine bones, 2 nasal bones, 2 lacrimal bones, vomer, 2 inferior conchae bones and mandible bone. ⁽²¹⁾ The occipital bone articulates with the atlas near the foramen magnum. The atlas articulates with the occipital condyle superiorly and the axis inferiorly. The spinal cord passes through the foramen magnum providing continuity for the central nervous system.

The muscles and their innervations:

The face has many muscles with different and unique function. They are innervated by different nerves but mostly by CN-VII. The muscles in face are known as "the muscles of facial expression". ⁽¹⁸⁾

The special for facial muscles is that are inserted directly into the skin. Contraction of the muscles causes the skin to move. Signals from the complex order of nerves to the various muscles instruct the muscles to move in combinations as well as individually. Bell's palsy temporarily prevents the nerve from transmitting signals to the muscles, causing weakness or paralysis. Another way the facial muscles differ from skeletal muscles is that they do not immediately begin to be atrophic when they are not used. This can take years before it happens. ⁽¹³⁾

Table 1, The nerves with their innervated muscles and action ⁽²¹⁾

Nerve	Innervated muscles	Muscle action
Oculomotor nerve	Levator palpebrae superioris	Upper eye lid
Trigeminal nerve	Masseter	Closing and protruding mandible
	Temporalis	Elevates and controls side to side movement of mandible
	Medial pterygoid	Elevates mandible
Aslo facial nerve	Lateral pterygoid	Protracts mandible, opens mouth
	Mylohyoid	Hyoid and mandible movement
	Digastric	Hyoid and mandible movement
Hypoglossal nerve	Genioglossus	Protraction of tongue
	Styloglossus	Elevation and retraction
	Hyoglossus	Depresses tongue
Pharyngeal plexus, branch of X-CN	Palatoglossus	Elevates tongue while swallowing
Cervical nerve C-1	Geniohyoid	Hyoid, tongue, and mandible movement
Accessory nerve	Sternocleidomastoid	Flexes head and rotate to opposite side
Dorsal rami of cervical nerves	Semispinalis	Extends head, supports turning
Dorsal rami of middle and lower cervical nerves	Splenius capitis	Extend head, supports turning
	Longissimus capitis	Extends head, supports turning
Suboccipital nerve C-1	Rectus capitis posterior major	Extends head
	Rectus capitis posterior minor	Extends head

3.2 The facial nerve

The facial nerve is the seventh (VII) of the twelve paired cranial nerves.

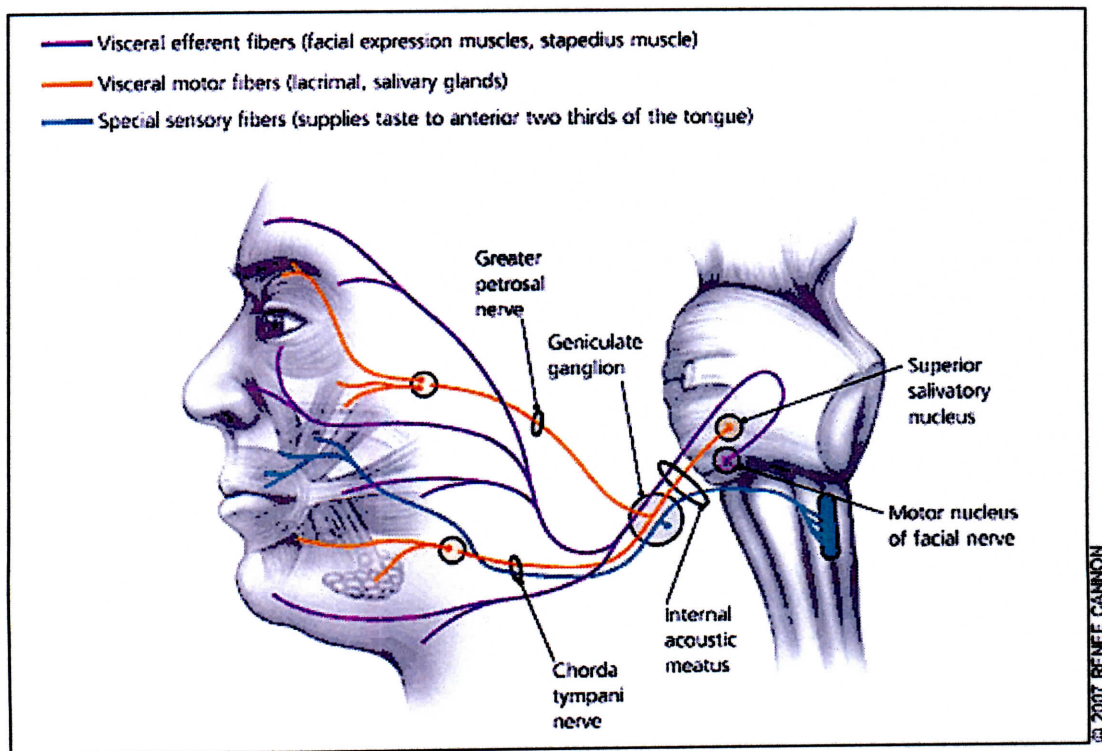
The facial nerve has both sensory fibres and motor fibres. The sensory part of the facial nerve arises from the nervus intermedius. Function of sensory fibers is: taste at the front 2/3 of the tongue and sensations at the outer ear are transmitted by the 7th nerve.⁽¹⁾

The motor nucleus of the facial nerve is located in the ventro-lateral part of the reticular formation of the pons near to the caudal border. They continue to innervate the individual facial muscles. (*Se table 2*).

The motor branch innervates facial muscles (*se table 2*) it also contains some sympathetic motor fibers which constitute the vasodilator nerves of the submaxillary and sublingual glands, and are conveyed through the chorda tympani nerve. These are preganglionic fibers of the sympathetic system and terminate in the submaxillary ganglion and small ganglia in the hilus of the submaxillary gland. From these ganglia postganglionic fibers are conveyed to these glands. From the dorsal aspect of this nucleus there emerge a large number of fine bundles of fibers, directed dorsomedially through the reticular formation. These rather widely separated bundles constitute the first part of the root of the facial nerve. Beneath the floor of the fourth ventricle the fibers turn sharply rostrad and are assembled into a compact strand of longitudinal fibers, often called the ascending part of the facial nerve. This ascends along the medial longitudinal bundle for a considerable distance (5 mm). The nerve then turns sharply lateral ward over the dorsal surface of the nucleus of the abducens nerve, and helps to form the elevation in the rhomboid fossa, known as the facial colliculus. This bend around the abducens nucleus, including the ascending part of the facial nerve, is known as the genu. The second part of the root of the facial nerve is directed ventrolaterally and at the same time somewhat caudally, passing close to the lateral side of its own nucleus, to make its exit from the lateral part of the caudal border of the pons. The facial nerve, firmer, rounder, and smaller than the auditory, passes forward and outward upon the middle peduncle of the cerebellum, and enters the internal auditory meatus with the auditory nerve. Within the meatus the facial nerve lies in a groove

along the upper and anterior part of the auditory nerve, and the pars intermedia is placed between the two, and joins the inner angle of the geniculate ganglion. Occasionally a few of its fibres pass into the auditory nerve. Beyond the ganglion its fibres are generally regarded as forming the chorda tympani. ⁽²⁾

At the bottom of the meatus, the facial nerve enters the aquaeductus Fallopii, and follows the course of that canal through the petrous portion of the temporal bone, from its commencement at the internal meatus, to its termination at the stylo-mastoid foramen. It is at first directed outward between the cochlea and vestibule toward the inner wall of the tympanum, it then bends suddenly backward and arches downward behind the tympanum to the stylo-mastoid foramen. At the point where it changes its direction, it presents a reddish gangliiform swelling (intumescencia ganglioformis or geniculate ganglion). On emerging from the stylo-mastoid foramen it runs forward in the substance of the parotid gland, crosses the external carotid artery, and divides behind the ramus of the lower jaw into two primary branches, temporo-facial and cervico-facial from which numerous offsets are distributed over the side of the head, face, and upper part of the neck, supplying the superficial muscles in these regions ⁽²⁾



Picture 1. Different fibres of facial nerve ⁽³²⁾

It divides into its main branches inside the parotid gland. These branches then further divide into 7000 smaller nerve fibres that reach into the face, neck, salivary glands and the outer ear.

Table 2. Muscles innervated by facial nerve ⁽²⁾:

Motor branches of the facial nerve	Innervated muscles	Muscle action
Posterior auricular	Posterior auricular	Pulls ear backward
	Occipitofrontalis, occipital belly	Moves scalp backward
Temporal	Anterior auricular	Pulls ear forward
	Superior auricular	Raises ear
	Occipitofrontalis, occipital belly	Moves scalp forward
	Corrugator supercilii	Pulls eyebrow medially and downward
	Procerus	Pulls medial eyebrow downward
Temporal and zygomatic	Orbicularis oculi	Closes eyelids and contracts skin around eye
Zygomatic and buccal	Zygomaticus major	Elevates corners of mouth
	Zygomaticus minor	Elevates upper lip
	Levator labii superioris	Elevates upper lip and midportion nasolabial fold
Buccal	Levator labii superioris alaeque nasi	Elevates medial nasolabial fold and nasal ala
	Risorius	Aids smile with lateral pull
	Buccinator	Pulls corner of mouth backward and

	Levator anguli oris Orbicularis Nasalis, dilator naris Nasalis, compressor naris	compresses cheek Pulls angles of mouth upward and toward midline Closes and compresses lips Flares nostrils Compresses nostrils
Buccal and marginal mandibular	Depressor anguli oris Depressor labii inferioris	Pulls corner of mouth downward Pulls lower lip downward
Marginal mandibular	Mentalis	Pulls skin of chin upward
Cervical	Platysma	Pulls down corners of mouth
Oral cavity floor	Stylohyoid	Elevates hyoid

3.3 Facial nerve injuries and paralysis

Definition: Facial nerve palsy is a nervous system disorder in which a damaged nerve in the skull affects the movement of the muscles of the face. It is a form of cranial mononeuropathy of the 7th cranial nerve. ⁽⁸⁾

Disease organisms attacking tissues through which the facial nerve runs can disorder its function and anything that may cause swelling or pressure on the nerve can result abnormal function.

Some of the general causes of problems along the pathway of the facial nerve include:

- Congenital (birth) abnormalities
- Infections of the middle ear (otitis media or cholesteatoma)
- Infections or tumour of the parotid gland
- Facial and neck trauma
- Complication after an operation in the ear area (for example, after mastoidectomy)

The most common causes of facial nerve paralysis a viral infection called Bell's palsy.

To evaluate and determinate the cause starts with taking history of the problem, then a physical examination with various tests must be done to determine if the nerve damage is central or peripheral. In central it is damaged at the brain level. Peripheral is closer to the ear and face area. (*Se table 3*). ⁽¹⁸⁾

The Vestibulocochlear nerve (8th) is located close to facial nerve, and can also be affected when facial nerve is paralyzed. Then it may appear sensorineural hearing loss.

The examination can determine the level of paralysis. The paralysis can be complete, then the whole nerve is paralysed or it can be incomplete when it is partial paralyzed.

After history taking and physical examination an X-ray is performed, computed tomography (CT) scan or magnetic resonance imaging (MRI) scan. This helps to diagnose and determine exactly where the swelling, trauma, tumour or infection may be that's causes the abnormality in the facial nerve. Electromyography (EMG) is used to test the electrical impulses in each muscle. EMG helps to find out whether the problem lies in nerve innervations or the muscle itself. Can also use nerve excitability test (NET) here electrical impulses is used to compare normal facial nerve and the abnormal one. ⁽³⁾

Then test of tear production is done together with saliva production, taste sensation and small ear movement. This is the topographic localization.

Surgically treatment is done when the paralysis will not resolve by it self. It can happen after facial trauma, tumours or severe otitis media or when the nerve has been divided by trauma. In these instances the nerve will continue to die until a surgical procedure is undertaken. ⁽³⁾

3.4 Central paresis versus peripheral paresis

As mentioned there is a difference between central and peripheral paresis of the face. Central paresis affects the supranucleus and only the lower part of the face is affected because of the bilateral upper motor neuron innervated of the forehead. Signs for central paresis are: The upper facial muscles are partially spared in an UMN lesion because of alternative pathways in the brainstem. There appear to be different pathways for voluntary and emotional movement.⁽⁴⁾ After a stroke this may happen, and a stroke is a condition that arises when cerebral neurons are injured by the sudden blockage of blood supply to that part of the brain. These neurons initiate movements of the face by sending signals to neurons in the brainstem. From the brainstem nerve fibres spread out to cover the face⁽⁵⁾

The peripheral paresis affects the infranucleus (lower motor neurons) both the upper and the lower parts of face are involved equally. Bell's palsy is the most common cause of infranuclear paralysis of facial nerve. The nerve is often involved around the stylomastoid foramen, but signs and symptoms depends on the of nerve involvement. The attack is usually acute and the immediately drop of muscles occur and occasionally some pain behind the ear. Taste sensation from ipsilateral anterior two-thirds of the tongue may be lost and hyperacusis.⁽³⁾ The final common pathway to the muscles is destroyed.⁽⁴⁾

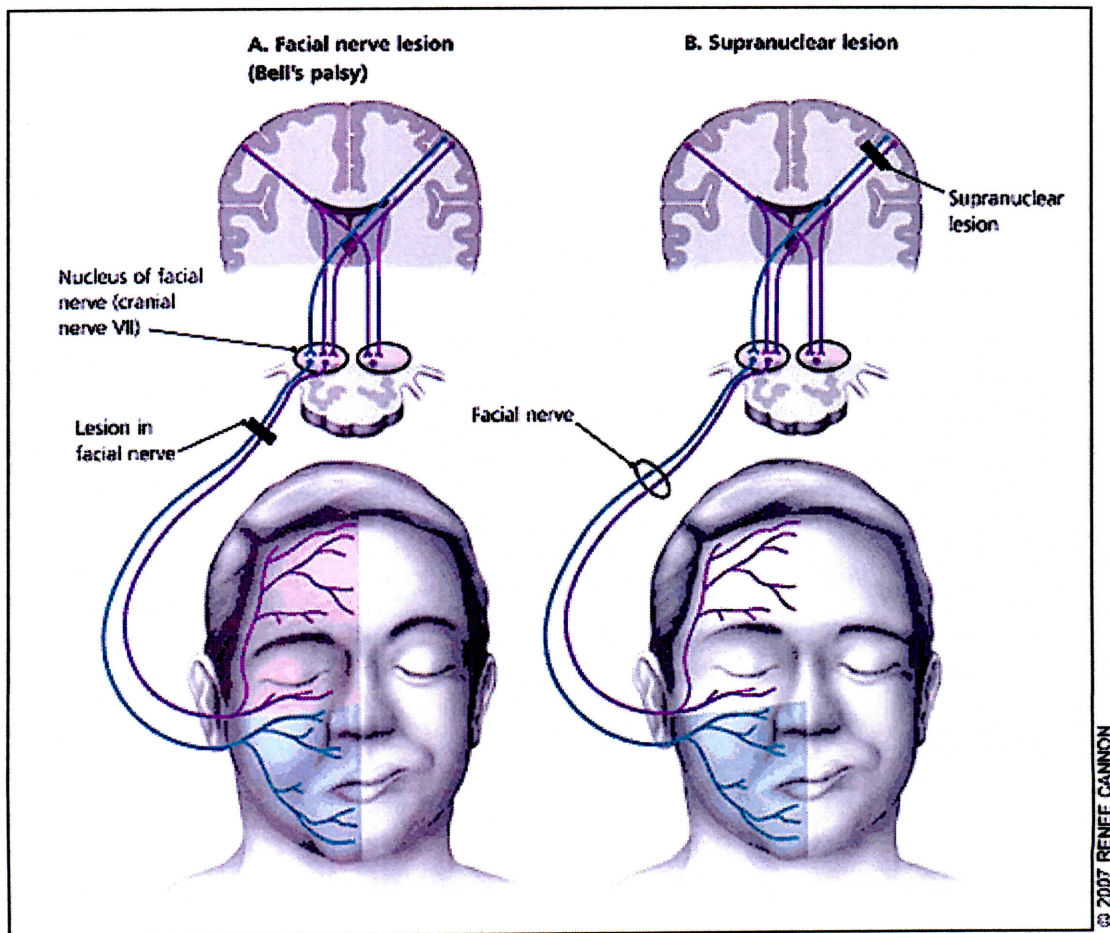
The reason that the paresis looks different after a stroke than primary facial nerve injury as Bells palsy:

The cerebral neurons from the left side of the brain sends signals to brainstem neurons whose nerves innervate muscles on the right side of the face and right sided cerebral neurons go to brainstem neurons that innervate muscles on the left side.⁽¹⁹⁾ But the facial nerve is somewhat unusual in that the fibres that go up to the upper face (muscles around the eye and the forehead) come from cerebral neurons on both the right and left side of the brain. This results in a difference between how facial paralysis looks if there is injury to the brain (from a stroke) or a injury to the facial nerve itself (Bell's palsy).⁽⁵⁾

Facial nerve lesions

A) Infranuclear lesion	B) Supranuclear lesion
<p>Ipsilateral lesion.</p> <p>It can be:</p> <ol style="list-style-type: none"> 1. Lesion of ofnucleus/pontine fibres: Complete unilateral palsy, loss of CN- V, VI, VII, taste, opposite limbs longtracts. 2. Temporal bone fracture: Complete unilateral palsy, loss of taste, decreased hearing or hyperacusis. 3. Facial canal: an middle ear infection- Bell's palsy 4. Other: Multiple sclerosis, surgery, acoustic neuroma, herpes, diabetes, sarcoid 	<p>Contra lateral lesion.</p> <p>Only lower quarter of face is affected. The patient is able to raise both eyebrows.</p> <p>After stroke that is involved on the left side of the brain the paralysis will occur in the right lower part of face. And the upper face has bilateral innervations.</p>

Table 3, Facial nerve lesions ⁽¹⁸⁾



Picture 2, Infranuclear palsy and supranuclear palsy ⁽³³⁾

3.5 Conditions which can affect the cranial nerve

- Diabetes mellitus
- Multiple Sclerosis
- Tumors
- Sarcoid
- Vasculitis (e.g. polyarteritis nodosa)
- Systemic Lupus Erythematosus
- Syphilis

Chronic meningitis (malignant, tuberculosis, or fungal) tends to pick off the lower cranial nerves one by one.⁽²²⁾

Viruses that may be the reason: Infection with herpes simplex virus (HSV) type 1 may be its major cause. Varicella zoster virus (VZV) reactivation (Ramsay Hunt syndrome) is less common, but may appear without skin lesions in a form indistinguishable from Bell's palsy⁽¹⁰⁾

3.6 Different diagnosis of facial paresis

Bells palsy

Bell's palsy is a form of temporary facial paralysis resulting from damage or trauma to one of the two facial nerves innervating the face.⁽²⁰⁾ It is the most common cause of facial paralysis and weakness. Bell's palsy affects only one of the paired facial nerves and one side of the face, but in rare cases, it can affect both sides. Symptoms of Bell's palsy usually begin suddenly and reach their peak within 48 hours. Symptoms range in severity from mild weakness to total paralysis and may include twitching, weakness, or paralysis, drooping eyelid or corner of the mouth, drooling, dry eye or mouth, impairment of taste, and excessive tearing in the eye. Bell's palsy often causes significant facial distortion. Most scientists believe that a viral infection such as viral meningitis or the common cold sore virus; herpes simplex that causes the disorder when the facial nerve swells and becomes inflamed in reaction to the infection.⁽¹²⁾

Synkinesis is often developed. This can be seen when patient blinks and the mouth follows in the movement with twitching of the corner of the mouth. This is caused by misrouting of the facial nerve fibres. Some patients may have “crocodile tears” or start to sweat in the ear which can come when eating. This is caused by a mix-up in autonomic fibres carried by the facial nerve.⁽¹²⁾

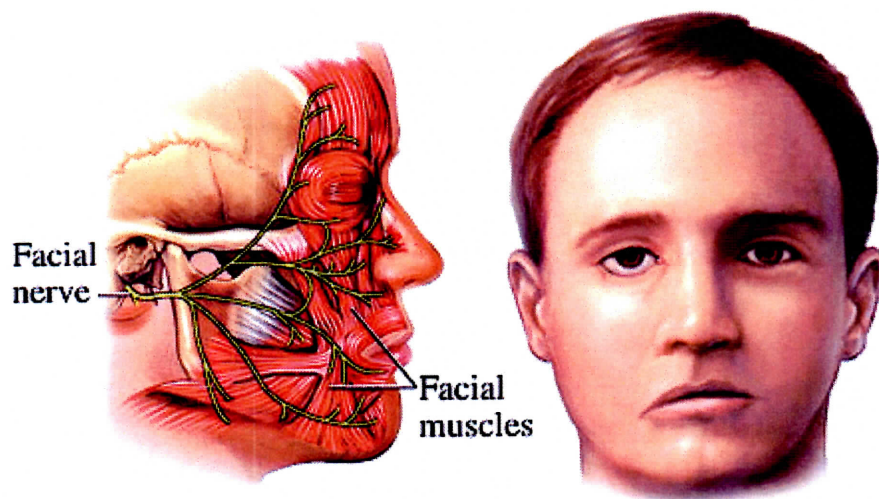
Prognosis:

The prognosis for Bell's palsy is generally very good. With or without treatment, most patients begin to get significantly better within 2 weeks, and about 80 percent recover completely within 3 months. In some cases the symptoms may last longer, and in few cases unfortunately the symptoms never disappear completely. ⁽¹³⁾

Complications that can occur:

- Disfigurement from loss of facial movement
- Damage to the eye (corneal ulcers and infections)
- Chronic spasm of face muscles or eyelids
- Chronic taste abnormalities
- Abnormal regeneration (nerves grow back to the wrong structures - for example, smiling causes the eye to close) ⁽¹⁴⁾

About 7% of patients have recurrent Bells palsy. The mean recurrence interval is 10 years. Recurrent Bells tends to cluster in families as well as in diabetic patients ⁽¹¹⁾



Picture 3. Bell's palsy causes paralysis or weakness of the muscles on one side of the face. It results from facial nerve paralysis that causes the affected side of the face to appear flat, expressionless, or droopy. ⁽³⁴⁾

Moebius Syndrome

Moebius Syndrome is an extremely rare condition which typically affects the sixth and seventh cranial nerves. It is caused by underdevelopment of facial nerves and this causes facial paralysis. Characteristics include: Impaired ability in infants to suck, inability to follow objects with the eyes so instead the child turns his whole head to follow, lack of facial expression and inability to smile, strabismus of eyes. Delayed crawling and/or walking due to low muscle tone among others. ⁽⁹⁾

Ramsay Hunt Syndrome

Ramsay Hunt syndrome (also termed Hunt's Syndrome and herpes zoster oticus) is a herpes zoster virus infection of the geniculate ganglion of the facial nerve. It is caused by reactivation of herpes zoster virus that has previously caused chickenpox in the patient. It is a paralysis of the facial muscles on the same side of face as the infection is. The virus infects the facial nerve and the muscles it innervates. Ramsay Hunt syndrome is typically associated with a red rash and blisters (inflamed vesicles or tiny water-filled sacks in the skin) in or around the ear and eardrum and sometimes on the roof of the mouth or tongue. The symptom is a red painful rash associated with blisters in the ears or mouth and facial paralysis on one side of the face. Other symptoms such as ear pain, hearing loss, dizziness (or vertigo), dry eye, and changes in taste sensation may also occur. It is diagnosed by observing if there is a red painful rash with ear and or mouth blisters and one-sided facial paralysis. And a PCR test (polymerase chain reaction) can be performed on the fluid from the blisters to demonstrate the viral genetic material, but this test is not done routinely. ⁽⁶⁾

The syndrome is not contagious but the herpes zoster virus that can be found in the blisters of Ramsay Hunt syndrome can be transmitted to other people and cause chickenpox in those that are unvaccinated against chickenpox. Individuals with Ramsay Hunt syndrome should avoid contact with newborns, pregnant women, immunodepressed individuals, and people with no history of chickenpox, at least until all the blisters change to scabs. The infection is treated with antiviral agents, steroids, and pain medications ⁽⁶⁾

Why is Ramsay Hunt syndrome compared with Bell's palsy?

Bell's palsy also is a result of injury to the facial nerve by virus infection, but Bell's palsy is idiopathic. Ramsey Hunt syndrome on the other hand is caused by the Varicella virus (herpes zoster) that also causes chickenpox and shingles (a painful, blister-producing herpes zoster reinfection that usually occurs on one side of the body). There is no red rash associated with Bell's palsy as there is with Ramsey Hunt syndrome, and it is commonly more painful. But both can cause eyelid and mouth paralysis on one side of the face. Treatment consists of antiviral agents for about one week, steroids and pain medications. The treatment should start within three days after the symptoms start to appear. And early treatment usually gives better prognosis. To prevent Ramsay Hunt syndrome a vaccine for chickenpox is given. However, once a person gets chickenpox, the person is susceptible to reactivation of the virus. ⁽⁶⁾

3.7 Therapy used for Bell's palsy

Main therapy is:

- Soft tissue techniques,
- Muscle stimulation and re-education,
- Active exercises to remain strength in face muscles,
- Positioning and regime,
- Heat procedures.

Nurse Kenny method

We use the stimulation part on paretic patients. Used for preparation of neuromuscular system for re-education of functionally weak muscles.

It is divided into 3 phases:

1. Passive extension or stretching of muscle (stimulation of motor neurons)
2. Fast vibratory movements in physiological direction- excitation of antagonistic motor neurons. Facilitation and reciprocal inhibition of motor neurons of stimulated muscles.
3. Repetitive passive stretching of muscle ⁽²⁾

Hot wraps according nurse Kenny

Moist heat wraps applied to the affected side of the face may help reduce the pain.⁽²⁾

Soft ball method

Use a small soft spongy ball to make friction and rolling of the skin, muscles and facia. It is used to relax tensed muscles and to increase the skins ability to stretch.

Electro stimulation

This is used on patient with Bell's palsy that shows no muscle contraction at all during 2 months after first signs. The electrical currents may be used to activate the nerve for contraction in a denervated muscle.⁽²⁷⁾ That means that the nerve has lost its peripheral nerve supply. The purpose of the electrical stimulation in denervated muscles is to help minimize the extent of atrophy during the period while the nerve is regenerating. When the muscle is denervated the muscle fibers experience a number of progressive anatomic, biochemical and physiological changes that leads to decrease in the size of the individual muscle fibers and in the diameter and weight of the muscle. The consequence is that there will be a decrease in the amount of tension that can be generated by that muscle and an increase in the time required for the muscle to contract. These changes progress until the muscle is reinnervated by axons regenerating across the site of lesion. If this does not occur within 2 years the recovery of the muscle is not possible.⁽¹⁷⁾

Vojta therapy

Vojta therapy is also used on patients with Bell's palsy and is performed by a Vojta therapist and by pressing specific points on face it is possible to re-activate facial movement that has been lost because of the paresis.⁽³¹⁾

3.8 Other methods used for rehabilitation

Botulinum toxin

Treatment with botulinum toxin may be used when there is orbicular synkinesis and hypertonic muscles after facial paralysis. The patient has problems with closing the eye and that leads to problems for the eye to stay wet and prevent diseases in the eye. To close the eye the botulinum toxin injections is inserted into the m.orbicularis oculi muscle so that the patient can close his eye as normally. ⁽⁷⁾

Hyperbaric oxygen therapy

This is a treatment that can be added for improvement of the recovery time of Bells Palsy. Hyperbaric Oxygen Therapy requires the patient to be enclosed in a pressurized environment. One hundred percent oxygen is administered as the pressure inside the tube is slowly brought to just less than 3 times than the normal atmospheric pressure. This increases blood flow to tissues and encourages re-growth of the nerve. ⁽¹⁵⁾

Pharmacologic treatment

- Corticosteroids may reduce swelling and relieve pressure on the facial nerve
- Acyclovir, an antiviral agent, is used in conjunction with steroids.
- Lubricating eye drops or eye ointments may be recommended to protect the eye if it cannot be closed completely.
- Vitamin B-12:
B-12 is most helpful in its form methylcobalamin and is essential to maintaining the health of nerves. This has been found to be beneficial in the healing and re-growth of these nerves as well. Also E, B1 vitamins helps. ⁽¹⁶⁾

3.9 Contraindications

Electrostimulation: This is contraindicated if there is any contraction of facial muscles, and then it can damage the healing nerve.

It have to be mentioned that patients with Bells palsy needs to be patient, the work with muscles is performed very gently, and the most important is to regain motion but most important to se the motion is balanced with the good side.

Another important factor is that the quality is more important than quantity, so it is important to do the therapy when the patient is not tired or stressed. Then the therapy can have reverse effect.

As a rule:

„It's better to exercise correctly just a few times than to do it incorrectly many times“

4. Methodology

In my special part of the thesis is attempted to do the examination of all relative test that is necessary for peripheral facial paresis. All data are subjective from the view of the author and conclusions of different test are based on previous learned examinations.

Equipment used was a face cream for softening of his skin in the end of procedure. Nothing more advices were used for examination or therapy. The patient came to therapy every day, between 8 and 10 a.m. And the daily therapy took approximately 30-40 minutes.

5. Special part

5.1

Examined person: J.V, male

Year of birth: 1971

Diagnosis: Facial nerve paresis, right side.

Present state

Patient has a paresis in the right side of face. This is the 10th day after the paresis occurred. The patient is an out-patient, and arrives on time without any help. His main problems are asymmetry in his face, mouth drop and problems with closing his right eye. He feels pain in the eye area, frontalis area, temporalis area and down to his cheek.

Height: 176 cm

Weight: 105 kg

BMI: 33,9

Anamnesis

Chief complaint: The patient says that he has pain in the eye area and the forehead, back to the ear and down to the cheek. He has pain in his right eye in the morning, it gets better during the day, but in the evening the pain in front and sides around the ear area starts.

History of present problem: The facial nerve paresis occurred when he was driving his car home from work in Slovakia, it was very cold and there was a cold wind blowing in his face. Suddenly a tingling and stiff feeling appeared in his face and he recognized that he had problems with the taste function. Then the mouth started to drop down to the cheek and the same happened to the eye. All this happened during one minute's time.

Functional history: He is not able to eat hard food. He is not recommended by his doctor to watch TV or do facial expressions, no hard chewing and not sleep on paretic side. In the beginning he had taste impairments, hyperacusis and could not close the eye at all.

Psychosocial history: The patient lives with his girlfriend, drives car to rehabilitation. And he works as a truck driver.

Medical history: He had a facial paresis 3 years ago, this one also on the right side. He received vitamin B1, B6, B12 and corticoids for one week after the paresis occurred. He also has Diabetes Mellitus. He started taking Diaprel and Glucofage 3 years ago, as treatment for the DM.

Medications: Medications used are Diaprel and Glucofage.

Allergy: No allergies.

Diet: He eats soft food, cut in peaces. Liquid runs out of his mouth.

Family history: His father has Diabetes Mellitus.

Sport anamnesis: He plays hockey and tennis.

Abuses: No abuses.

Previous rehabilitation

He had facial paresis 3 years ago, on the right side. The rehabilitation was good and improving. It included massage and soft tissue techniques. The patient is unable to recall the duration of this treatment.

5.2

Statement from the patient's medical documentation

Friday 30.01.09 The patient was driving his car home from work in Slovakia. There was a cold wind blowing in his face, and suddenly he felt the mouth and eye drop on the right side of his face. His perception of taste was also drastically reduced. The VII-nerve

probably swelled up in the facial canal because of the cold wind blowing in his face. He must receive therapy every day until he reaches a normal state again. It is also recommended for him to keep a calm regime and not to watch TV or do any facial expressions, no hard chewing and no sleeping on the paretic side.

Indication of rehabilitation from the medical doctors documentation:

The main indication is to relieve the patient from the pain in the face and head. It is necessary to relax the healthy side so that it will not start synkinesis of the face symmetry. Also try to strengthen and facilitate the paretic side. No asymmetries must occur.

5.3

Initial kinesiologic examination (09.02.09)

Observation: ⁽²⁵⁾ Patient is cooperative and understands orders. He talks blurry and must hold two fingers upon the lips on the healthy side, to prevent overusing the muscles around his mouth.

Aspection: ⁽²⁵⁾ Face asymmetry is present. Especially the eye and mouth is drawn to the left side. His skin and lips look normal. The face is without signs of oedema. He is not able to close his right eye completely, a 5mm opening remains. The wrinkles of his forehead are gone on the right side. He has a deeper nasal line than normal on the healthy side. He is now able to close the eye on the paretic side, but not completely.

Palpation: ⁽²⁵⁾

Skin: Resistance of skin: Higher resistance on the healthy side in the superficial and deep layer of the skin.

Mobility: More mobility in the paretic flaccid side.

Temperature: Colder on the paretic side.

Moisture: The skin is normal to wet, but he uses day-cream before coming to therapy.

Roughness: The skin is rougher in the healthy side.

Provoking pain: Pain is present when making a fold with the subcutaneous tissue and stretching it on the healthy, overloaded chin.

Muscles: ⁽²⁵⁾ The muscles are hypertonic on his healthy side and completely plegic on the paretic side. Pictures are in the attachments.

Muscle testing:

Table 4. Muscle testing for initial kinesiological examination ⁽²⁴⁾

Innervated muscles	Muscle action	Muscle contraction or not
Posterior auricular	Pulls ear backward	No contraction
Occipitofrontalis, occipital belly	Moves scalp backward	No contraction
Anterior auricular	Pulls ear forward	No contraction
Superior auricular	Raises ear	No contraction
Occipitofrontalis, occipital belly	Moves scalp forward	No contraction
Corrugator supercilii	Pulls eyebrow medially and downward	No contraction
Procerus	Pulls medial eyebrow downward	No contraction
Orbicularis oculi	Closes eyelids and contracts skin around eye	No contraction

Zygomaticus major	Elevates corners of mouth	No contraction
Zygomaticus minor	Elevates upper lip	No contraction
Levator labii superioris	Elevates upper lip and midportion nasolabial fold	No contraction
Levator labii superioris alaeque nasi	Elevates medial nasolabial fold and nasal ala	No contraction
Risorius	Aids smile with lateral pull	No contraction
Buccinator	Pulls corner of mouth backward and compresses cheek	No contraction
Levator anguli oris	Pulls angles of mouth upward and toward midline	No contraction
Orbicularis	Closes and compresses lips	No contraction
Nasalis, dilator naris	Flares nostrils	No contraction
Nasalis, compressor naris	Compresses nostrils	No contraction
Depressor anguli oris	Pulls corner of mouth downward	No contraction
Depressor labii inferioris	Pulls lower lip downward	No contraction
Mentalis	Pulls skin of chin upward	No contraction
Platysma	Pulls down corners of mouth	No contraction
Frontalis	Wrinkles forehead	No contraction

Temporomandibular joint: No pain during palpating of the joint. Active movement of the joint was good. No restriction in the joint. ⁽²³⁾

Neurological testing according facial nerve paresis:

Reflexes: Blink reflex is present. ⁽³⁰⁾

Table 5. Neurological testing I⁽²⁵⁾

Tested part:	Result
Sensitivity to light:	Present, especially when it is sunny and if the wind blows a lot.
Sensitivity to sounds:	Present
Excessive tears:	Present
Not complete closing of eye:	Present (5 mm left to close)
Eyebrow drop:	Not present
Loss of forehead wrinkles:	Present
Nose runs:	Not present
Difficulty speaking:	Present
Difficulties to drink:	Present
Difficulties to eat:	Present
Excessive salivation or reduced:	Not present
Facial swelling:	Not present
Distorted taste:	Not present
Tinnitus:	Not present
Sensation:	Reduced

Cervical spine examination⁽²³⁾

Aspection:

Posterior side: The distance between his ear and shoulder are similar on both sides.

Anterior side: Mm. sternocleidomastoidei are prominent on both sides.

Lateral side: Forward head posture.

Breathing stereotype: Upper thoracic breathing.

Palpation:

Sitting position:

Transverse process of atlas: No pain around area.

Determination of C7: Prominent

Mm. sternocleidomastoidei insertion and origin: Insertion is not painful. Origin is painful at the medial border of the clavicle, bilaterally.

All his scalene muscles are also in hypertension, bilaterally.

Supine position:

Suboccipital muscles: In hypertension, bilaterally.

The spinous processes: No pain, normal appearance.

Sensation: Superficial sensation with a brush. No difference in sensation.

Active movement:

Table 6. Active movements I ⁽²⁹⁾

Movement	Result
Flexion In an arc Forward head movement Anteflexion between Co-C1	Normal Normal Restricted
Extension Continus extension that reaches C/Th crossing Retroflexion of occiput against atlas	Normal Restricted
Lateroflexion	Normal, billaterally
Rotation With a small C/Th flexion. In a straight posture	Rotation reaches C7 Rotation reaches Th4, billaterally

Passive movements:

Table 7. Passive movements I⁽²⁹⁾

Movement:	Result:
Flexion	3 fingers restriction
Extension	Normal
Lateroflexion	Normal
Rotation	
a) Straight head	Normal, Bilaterally
b) Max head and neck flexion C1/2	Normal, Bilaterally
c) Chin into neck, C2/3	Normal, Bilaterally
d) With extension of head and neck	Normal, Bilaterally

Manual muscle testing: ⁽²⁴⁾

Deep neck flexors: Grade 3

Superficial neck flexors: Grade 5

Sub occipital neck extensors: Grade 5

Examination of joint play in C-spine: ⁽²³⁾

In anterior, posterior and lateral direction, from C2/ C3 to C5/C6. No restriction is found.

Conclusion of examination:

The patient shows definite asymmetry in the face, his paretic side is atonic and there is no contraction in any of the muscles. The healthy side compensates by drawing

especially the mouth and eye to its side. This gives the patient problems with eating and drinking, because of the mouth drop.

Symptoms on the paretic side are: no visible wrinkles, problems closing the eye completely and the mouth drop. The cervical spine is in forward head position and he has weak deep neck flexors and strong superficial flexors. The neck extensors are in hypertone, and grade 5.

5.4

Short- term rehabilitation plan

The main goal is to reduce the pain, this is done by continuing the daily therapy at the rehabilitation and use the hot wraps.

Long-term rehabilitation plan

The ultimate goal is to gain completely normal function of the muscles and thereby return all mimics and facial expression to normal. Closing of the eye and mouth is absolutely necessary to live the life of a normal 38 year old man. We want to regain balanced and symmetrical movements by doing muscle relaxation and strengthening to avoid asymmetry of his face. The patient will go back to work within a short period and he will only start working part-time in case he gets a strong headache and does not feel well during the work. He will continue to come to therapy everyday if it is possible according to his work. He must also do his self therapy everyday, and the use of hot wraps must continue until the pain is completely gone and muscle contraction gets better.

5.5

Rehabilitation

Day to day therapy:

We started the therapy the tenth day after the paresis occurred. The first day I only did observation of the patient and the therapy applied.

Date: 11.02.09

Goal of today's therapy unit: To get a complete picture of the patient's problems and what the therapy should include.

Procedure:

The initial kinesiological examination included observation, aspection, palpation, and muscle testing of his face, test of the temporomandibular joint, C-spine examination, neurological testing with sensation and reflexes, and examination of all symptoms for the patient with the facial nerve paresis.

Results:

The anamnesis and all necessary data are collected for further therapy. It is necessary for the patient to have daily rehabilitation and to educate him to do self-treatment for better progression. It was important to remind him that he should not talk without keeping the healthy side fixated. This is to stop the synkinesis of the facial expressions.

Date: 12.02.09

Goal of today's therapy unit: Based on the examination it appears necessary to release the muscle tone on the healthy side, and to facilitate, stimulate and strengthen the paretic side. We also want the patient to experience correct use of the facial muscles and continue to use the correct movement and avoid synkinesis.

Procedure:

The first step is to observe the patient in the sitting position from the frontal view and look for any changes in his face. Then the patient lies in the supine position and we start with relaxation of the healthy side using: palpation to test the resistance, temperature, moisture and roughness of the skin. We also check for pain.

After that, we start soft tissue techniques of the superficial layer of the skin by an increased skin drag. Then the deeper layer is stretched by lifting up a skin fold and pushing the fingers together and squeezing with constant pressure until a release occurs. General relaxing massage for muscle tone release is also performed.

M. frontalis is facilitated and then the patient tries to perform voluntary contraction. Then relaxation, facilitation and contraction of the eyebrows are performed, in the horizontal and vertical directions.

It is important to relax the muscles around the nose, so relaxation by skin stretch is used around the nose and down to the mouth. Especially the area between the nose and mouth must be relaxed. Then the m.platysma is stretched by stretching the skin in which it is located.

When the muscle tone on the healthy side is reduced down to normal, we can start with muscle strengthening on the paretic side. M. frontalis is strengthened by creating horizontal wrinkles in the forehead. M. corrugator is strengthened by making a “mad face”. He also does a “kiss” and “fish-mouth” movement with his mouth.

Then the tongue and chin muscles are strengthened by moving the tongue from side to side with his mouth closed. If the patient is unable to keep his mouth closed, the therapist has to help. After that, the patient makes sounds like O, A, E, Y, I, and F, as loud and clear as possible. Here the therapist has to facilitate the muscles around the mouth.

In the end a relaxing massage with a face cream in the whole face is performed for 3 minutes. The whole therapy took approximately 30 minutes.

Results:

No differences in the face during visual observation. Physical examination shows that the healthy side is less hypertonic. The paretic side is still atonic. The patient is still unable to voluntarily close the eyes on the paretic side completely.

Date: 13.02.09

Goal of today's therapy unit: To day we concentrate on releasing the increased muscle tone on the healthy side. The patient has a tendency to use the healthy side to much even though he tries to avoid it.

Procedure:

A short observation of the facial muscles in the sitting position and then aspection and palpation in the supine position. Then therapy starts with concentration on letting the healthy side relax more to avoid synkinesis. This is also pain relieving for the patient.

The procedure is to start with stretching of the superficial layer by a skin drag. Then the deeper layer is stretched by lifting up a skin fold and pushing the fingers together and squeezing with constant pressure until a release occurs. This is performed several times, and the therapist will not stop until the skin is relaxed and a normal muscle tone appears. The focus is on the lower part of the face, around the chin and mandible, where it is easy to take up a skin fold and hold it here.

The nasal line area is also relaxed.

Then a warm up of the skin and muscles on the paretic side is performed. This is to facilitate and stimulate the soft tissues here. After that, facilitation and voluntary contraction is performed. M. frontalis is facilitated, and the patient tries to perform voluntary contraction by making wrinkles in his forehead. Then the relaxation, facilitation and contraction of the eyebrows are performed.

M.platysma is stretched by skin stretching. Muscle strengthening on the paretic side: M.frontalis, m.corrugator, and muscles around mouth does kiss and fish-moth contraction. He tries to close the paretic side of mouth voluntary, and moves his tongue lateral-lateral inside mouth, and tries to keep the mouth closed. He needed help with keep mouth closed, so fixation was necessary. Then the pronunciation therapy with facilitation in the direction of the movement the mouth makes contraction.

Then relaxing massage of whole face is performed for 3 minutes with closed eyes and deep breathing of the patient. With a thin face cream to moisturise the skin. The whole therapy took approximately 30 minutes.

Results:

After therapy he had lower muscle tonus in healthy overcompensated side of face. He says he feels better after therapy and not so tense on the healthy side, which is good since this is what today's therapy was concentrated on!

Date: 16.02.09

Goal of today's therapy unit: The goal is to get decreased muscle tone on healthy side and we want to see a contraction of muscles on the paretic side, and to release the high muscle tone on the healthy side. Facilitate, stimulate and strengthen his paretic side.

Procedure:

We start with observation and look if there are any changes that have occurred during the weekend.

On the healthy side muscles are in higher hypertone than last rehabilitation, this is because he has not done his self-therapy as we agreed. I instructed him again how to do the self-therapy.

Then we started with muscle relaxation of all hypertonic muscles on healthy side. And the patient feels pain relieving and more symmetric immediately.

Then the muscle strengthening and facilitation is performed. Concentrated especially in the area around the nose because the nose starts to deviate to the healthy side, it is important to facilitate the nose area and especially area between nose and mouth.

Further he does the muscle facilitation and strengthening of m.frontalis, m.corrugator, m. orbicularis oculi, m.orbicularis oris, m.nasalis and m.mentalis.

Then the tongue and chin muscles are strengthened and after that the speech therapy starts.

Then final strokes with vibration and relaxing strokes are applied. The whole therapy took approximately 40 minutes.

Results:

The therapy lasted longer today because it was necessary to relax the healthy side more. During the weekend the patient has not been able to do the self-therapy properly, so that he has much more restriction in his healthy side of face. The patient says himself that he feels more restriction on his healthy side, but also the improvement after applied therapy.

And there is still no ability to wrinkle the forehead or do any contraction of his chin. He still can't close his mouth completely when doing the tongue exercise.

Date: 17.02.09

Goal of today's therapy unit: Continue the rehabilitation as previous days and release the muscle hypertone on healthy side, which occurs after over-compensating of the facial muscles. Facilitate, stimulate and strengthen the paretic side. The goal is to get similar muscle tone on both sides. Educate him to know the feeling of correct use in his muscles, so that no alternating movement patterns and faulty use of facial muscles occur.

Procedure:

The same procedure as the previous days. With starting to observe him and look for changes in skin colour and look if the drop of mouth and eyelid is better.

Then relaxation techniques of healthy side until the feeling of hypertone are reduced. Relaxation of both superficial and deep layer is necessary.

In the deeper layer a skin fold is taken up and stretched, then reach the barrier and hold the fold to the release occurs. Also use a general massage for releasing muscle tone.

M. frontalis is facilitated and then patient tries voluntary contraction of forehead. Then the relaxation, facilitation and contraction of eyebrow are performed, in the horizontal and vertical directions.

For the nose we stretch the skin between the nose and mouth. This is important for avoiding nose deviation.

Then the whole m.platysma is stretched by skin stretching.

After relaxation of the tensed muscles we do muscle strengthening and facilitation of m.frontalis and m.corrugator.

Then the tongue and chin is strengthened.

Then he says letters loudly and clear sounds as: OOOO and AAAA. Here it must be facilitated with the movement of the mouth to help him use the muscles around the mouth when saying the letters. Also light fixation of healthy side. Important to not give resistance, because then it is movement against resistance, and that is what we don't want!

Then a few minutes with whole face relaxing massage. Performed with no contraction in the muscles and closed eyes of the patient. Also used a thin face cream to moisturise the skin.

Results:

There is lower muscle tonus in healthy side of face after therapy. Not able to close eye completely or mouth on paretic side by voluntary contraction.

Date: 18.02.09

Goal of today's therapy unit: Continue with similar therapy by trying to release the muscle hypertone on healthy side, after over compensating. Facilitate, stimulate and strengthen the paretic side.

Procedure:

Start with observation of the face in relaxed position and when he does facial expressions.

Then patient lies in supine position and we start with relaxation of healthy side by: palpation to test the resistance, the temperature, the moisture and roughness of the skin or if it provokes any pain.

Then start to stretch the superficial layer of skin by an increased skin drag, after that the deeper layer is taking up as a skin fold and stretched, then push the fingers together to reach the barrier and hold with same pressure to an release occurs.

Also general relaxing massage for releasing muscle tone is used.

M. frontalis is facilitated and then patient tries voluntary contraction by wrinkle the forehead up.

Then the relaxation, facilitation and contraction of eyebrow are performed, in both the horizontal and vertical directions.

Nose is relaxed and especially the area between nose and mouth. Then the m.platysma is stretched by skin stretching.

When muscle tone on healthy side is reduced down to normal muscle tone, we start with muscle strengthening on paretic side.

Strengthening of m. M. orbicularis oculi- orbital part with firmly closing of eyelid and then M. orbicularis oculi- palpebral part with closing gently the eye together, also the blinking is performed several times. This was important to day because it is windy and it is a very bright light outside.

Then the tongue and chin exercises is done.

Then the pronunciation therapy is applied. And after that a final stroke is applied, to relax the soft tissue of his face. The whole therapy took approximately 25 minutes.

Results:

There is lower muscle tonus in healthy side of face after therapy. Not able to close eye completely on paretic side by voluntary contraction. To day the therapy was in shorter duration, because the relaxation needed less time. The muscles used less time to be relaxed. We concentrated on the eye muscles because it was important to day because it is windy outside and it is a very bright light outside and this is annoying and sore feeling for the patient when he can't close the eye on paretic side. I also recommended him to wear sunglasses when it is very bright light outside or windy.

Date: 19.02.09

Goal of today's therapy unit: Release the muscle hyper tone on healthy side, after over compensating. Facilitate, stimulate and strengthen the paretic side. And hope that there is any contraction of the facial muscles on paretic side.

Procedure: The same procedure as previous days starting with to observe him and look for changes in skin colour and look if the drop of mouth and eyelid has any improvement.

Then start to relax the healthy side of face and continue until the feeling of hypertone is reduced. Relaxation of both superficial and deep layer is necessary.

In the deeper layer skin fold and general massage for releasing muscle tone is used.

M.frontalis is facilitated and then patient tries voluntary contraction of forehead.

Then the relaxation, facilitation and contraction of eyebrow are done, in both horizontal and vertical directions.

The skin of the nose is stretched especially to prevent more deviation of nose. Then the whole m.platysma is stretched by skin stretching.

After relaxation of the tensed muscles the muscle strengthening and facilitation of all face muscles are again applied. Then tongue and chin strengthening, when he tried to keep mouth closed.

Then he says letters loudly and clear sounds as: EEEEE and IIIII. With the facilitation of paretic side for helping the movement. Also light fixation of healthy side, with no resistance.

Also testing of the inner chin muscles is palpated, this is painful for the patient. This is done on both sides to check the muscle tone inside the mouth.

Then a few minutes with whole face relaxing massage. Performed *with no contraction* in the muscles and closed eyes of the patient.

Results:

There is lower muscle tonus in healthy side of face after the therapy. Still not able to close eye completely or mouth on paretic side by voluntary contraction. The testing of muscles inside the chin was painful and there is clearly hypertone of the muscles here, and hypotone on the paretic side.

He was again instructed to hold on healthy side when he talks not to overuse this side. We also refreshed the self-therapy so that he remembers to do it proper during the weekend.

Date: 20.02.09

Goal of today's therapy unit: Do the final kinesiological examination on the patient and give him instruction for further therapy.

Then therapy procedure performed as previous days.

Procedure:

First the final kinesiological examination then the normal procedure of the daily therapy.

First warm up of the skin on both sides, then start to stretch the superficial layer of skin by an increased skin drag, after that the deeper layer is taking up as a skin fold and stretched, then push the fingers together to reach the barrier and hold with same pressure to an release occurs.

Also general relaxing massage for releasing muscle tone is used.

Then the m.corrugator is relaxed, facilitated and then the contraction of eyebrow is performed, in the horizontal and vertical directions. Procedure repeated three times.

Nose area and m.platysma area is relaxed by skin stretch.

When muscle tone on healthy side is reduced down to normal muscle tone, the muscle strengthening on paretic side starts. And look for contraction.

Then the pronunciation therapy starts and he tries to whistle and do kiss like movements.

Then a taping of the m.orbicularis oculi is done. This is to facilitate the lower part to contract.

Then relaxing massage of whole face is performed for 3 minutes. The whole therapy took approximately 35 minutes.

Results:

Se the final kinesiologial examination.

We also did taping of inferior part of m. orbicularis oculi on paretic side. This was to facilitate the muscle to start work. He wears the tape to the next day of therapy.

Self- therapy:

He must do facial expression exercises in front of a mirror every day. He must lie down and hold the mirror in front of the face to se the asymmetry when exercising. Here he does the therapy similar to the therapy performed at the clinic.

He also uses the hot-wraps on the affected side especially to reduce pain. This is used every day in acute face, but now he uses it twice a week.

5.6

Final kinesiologic examination (20.02.09)

Observation: He talks much better now, the speech is clearer and more understand fully. He still holds on healthy side with two fingers, not to overuse the muscles around his mouth. He looks more watchful and comfortable with of the situation and how the therapy is applied on him.

Aspection: Face asymmetry is still present. Especially the eye and mouth is drawn to left side. Skin and lips look normal. No edema in face. The wrinkles of his forehead are missing on right side, but a small contraction is seen in the upper right corner of the m.frontalis. He has a deeper nasal line than normal on healthy side. He is now able to do closing of the eye on paretic side, but not completely and now 2-3 mm more closing is possible.

Palpation

Skin:

Resistance of skin: Still higher resistance on healthy side in superficial layer of the skin and deep layer.

Mobility: Higher mobility in the paretic flaccid side.

Temperature: Equal on both sides.

Moisture: Skin is normal moisturized.

Roughness: The skin is still rougher in the healthy side.

Provoking pain: Pain is less present when making a fold with subcutaneous tissue and stretch it on the healthy overloaded chin.

Muscles: A small contraction is felt in some muscles. (*Se table below*)

Pictures are in the attachments.

Manual muscle testing: ⁽²⁴⁾

Table 8. Muscle testing for final kinesiological examination

Innervated muscles	Muscle action	Muscle testing 11.02.09	Muscle testing 20.02.09
Posterior auricular	Pulls ear backward	No contraction	No contraction
Occipitofrontalis, occipital belly	Moves scalp backward	No contraction	No contraction
Anterior auricular	Pulls ear forward	No contraction	No contraction
Superior auricular	Raises ear	No	No contraction

Occipitofrontalis, occipital belly	Moves scalp forward	contraction	No contraction
Corrugator supercilii	Pulls eyebrow medially and downward	No contraction	Contraction
Procerus	Pulls medial eyebrow downward	No Contraction	No contraction
		No contraction	
Orbicularis oculi	Closes eyelids and contracts skin around eye	No contraction	Contraction
Zygomaticus major	Elevates corners of mouth	No contraction	No contraction
Zygomaticus minor	Elevates upper lip	No contraction	No contraction
Levator labii superioris	Elevates upper lip and midportion nasolabial fold	No contraction	No contraction
Levator labii superioris alaeque nasi	Elevates medial nasolabial fold and nasal ala	No contraction	No contraction
Risorius	Aids smile with lateral pull	No contraction	No contraction
Buccinator	Pulls corner of mouth backward and compresses cheek	No contraction	Contraction
Levator anguli oris	Pulls angles of mouth upward and toward midline	No contraction	Contraction
Orbicularis Oculi			
Nasalis, dilator naris	Closes and compresses lips	No contraction	Contraction
Nasalis, compressor naris	Flares nostrils	No contraction	No contraction
	Compresses nostrils	No contraction	No contraction

Depressor anguli oris	Pulls corner of mouth downward	No contraction	No contraction
Depressor labii inferioris	Pulls lower lip downward	No contraction	No contraction
Mentalis	Pulls skin of chin upward	No contraction	No contraction
Platysma	Pulls down corners of mouth	No contraction	No contraction
Frontalis	Wrinkles forehead	No contraction	Contraction

(The text that is marked with red letters has been improved)

Temporomandibular joint:⁽²³⁾

No pain during palpation of the joint. Active movement of the joint was good. No restriction in the joint.

Neurological testing according facial nerve paresis

Reflexes: Blink reflex is present.⁽³⁰⁾

Table 9. Neurological testing II⁽²⁵⁾

Tested part:	Initial kinesiological examination	Final kinesiological examination
Sensitivity to light:	Present, especially when it is sunny and if the wind blows a lot.	Present, especially when it is sunny and if the wind blows a lot.
Sensitivity to sounds:	Present	Not present
Excessive tears:	Present	Present
Not complete closing of eye:	Present (5 mm left to close)	Present (3mm left to close)
Eyebrow drop:	Not present	Not present
Loss of forehead wrinkles:	Present	Present, but can se trace of contraction in superior quarter of m.Frontalis
Nose runs:	Not present	Not present

Difficulty speaking:	Present	Still present, but better. He talks more clearly and understandable. But still he must hold on the healthy side of mouth when he talks
Difficulties to drink:	Present	Present but better now
Difficulties to eat:	Present	Present, but eats normal food now, not only soft food.
Excessive salivation or reduced:	Not present	Not present
Facial swelling:	Not present	Not present
Distorted taste:	Not present	Not present
Tinnitus:	Not present	Not present
Sensation:	Reduced	There is still reduced sensation on paretic side.

(The text that is marked with red letters has been improved)

Cervical spine examination: ⁽²³⁾

Aspection:

Posterior side: The distance between ear and shoulder are similar on both sides.

Anterior side: Mm.sternocleidomastoid is prominent on both sides.

Lateral side: Forward head posture.

Breathing stereotype: Upper thoracic breathing.

Palpation

Sitting position:

Transverse process of atlas: No pain around area.

Determination of C-7: Prominent

Mm. sternocleidomastoid insertion and origin: Insertion is not painful. Origin is painful at medial border of clavicle, bilaterally.

All scalene muscles also in hypertension, bilaterally.

Supine position:

Suboccipital muscles: In hypertension, bilaterally.

The spinous processes: No pain, normal appearance.

Sensation: Superficial sensation with a brush. No difference in sensation.

Active movement:

Table 10. Active movement II ⁽²⁹⁾

Movement	Result
Flexion In an arc: Forward head movement Anteflexion between Co-C1	Normal Normal Restricted
Extension Continus extension that reaches C/Th crossing Retroflexion of occiput against atlas	Normal Restricted
Lateroflexion	Normal, billaterally
Rotation With a small C/Th flexion. In a straight posture	Rotation reaches C7 Rotation reaches Th4, billaterally

Passive movements:

Table 11. Passive movement II ⁽²⁹⁾

Movement:	Result:
Flexion	3 fingers restriction
Extension	Normal
Lateroflexion	Normal

Rotation	
a)Straight head	Normal, Bilaterally
b)Max head and neck flexion C1/2	Normal, Bilaterally
c)Chin into neck, C2/3	Normal, Bilaterally
d) With extension of head and neck	Normal, Bilaterally

Manual muscle testing: ⁽²⁴⁾

Deep neck flexors: Grade 3

Superficial neck flexors: Grade 5

Suboccipital neck extensors: Grade 5

Examination of joint play: ⁽²³⁾

In anterior, posterior and lateral direction, from C2/ C3 to C5/C6. No restriction found.

5.7.1

Therapy effect evaluation

After been working with the patient for 8 days I can only observe a little improvement. Only m.frontalis, m.orbicularis oculi, m.buccinator, m.levator anguli oris and m.currogator supercilli has been improved in muscle contraction. But his mental and psychological state has been improved. The patient relaxes more during therapy and talks more with the therapist and other patients at the rehabilitation clinic. The talk is improved and has been clearer to understand.

He is able to close his eye on paretic side with 1-2mm more.

During therapy he feels less pain when therapist makes a fold in the subcutaneous tissue on the healthy side and then stretches it. The temperature on paretic side is now almost similar to the healthy before therapy as well. His skin has normal moisture.

The taste impairments is gone, hyperacusis is decreased back to normal hearing and can now close the eye more than when it first occurred. Now it is an opening in 3 mm.

The patient was calm and quite and also cooperative during all therapy applied.

5.7.2

Prognosis

Since there now is trace of progression in the muscle contraction we hope that the progression will continue. Step by step the muscles will hopefully start to work proper and the patient will get his facial expressions back, and the possibility to use the muscles of the face expressions balanced and in coordination. He must continue with therapy to the face is back in normal condition.

6. Conclusion

In the 3rd day of my practice I choose the patient who I wanted to write the bachelor thesis about. I thought that a patient with Bell's palsy could be very interesting, because I never had a patient like this before. I got to use a lot of techniques we only learned about theoretically or performed on healthy models. To perform this on a diagnosed patient was very different from doing it on healthy models. It was good to feel it in my own hands and do therapy that really was necessary for this patient. Also an important factor for my choice was that the patient had therapy every day, so that I got to practice and do therapy as much as possible. The first day I did initial kinesiological examination and decided what to concentrate on further in the therapy. The next days I did the therapy on my own and decided what I had to concentrate more about and work harder with. The patient has speech problems because of the paresis, but understood some English words. I had to show him what I wanted him to do or try to explain it with my poor Czech language knowledge. If there were *problems* with the

communication there was no problem to ask the other physiotherapist near by for some translation. So I do not think there was a problem with communication or therapy applied during the practice. The patient was also calm and relaxed, and he was cooperative and helpful in all situations.

I was at the neurology department for two weeks at Fakultni nemocnice Kralovske Vinohrady. This was very good for me and my experience because I think that neurological diseases are very interesting to work with and I did not have so much experience with working in neurology department. There were out-patients, in-patients and an intensive care unit at the neurology department. I worked mostly with in-patients with different diagnosis as stroke patients, MS-patients and cerebral palsy.

After working 10 days at neurology department I feel that I have been even surer about my knowledge and practice experiences. All the physiotherapists that worked there were great and learned me a lot. I am grateful that they trusted me enough to have patients on my own each day. As a sum up I have to say that I had a very good practice and got to see and feel a lot of patients I never had the opportunity to do therapy on before this practice.

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Table explanations:

Table 1, The nerves with their innervated muscles and action ⁽²¹⁾

Table 2, Muscles innervated by facial nerve ⁽²⁾

Table 3, Facial nerve lesions ⁽¹⁸⁾

Table 4, Muscle testing for initial kinesiological examination ^{(21) (24)}

Table 5, Neurological testing I ⁽²⁵⁾

Table 6, Active movements I ⁽²⁹⁾

Table 7, Passive movements I ⁽²⁹⁾

Table 8, Muscle testing for final kinesiological examination ⁽²⁴⁾

Table 9, Neurological testing II ⁽²⁵⁾

Table 10, Active movement II ⁽²⁹⁾

Table 11, Passive movement II ⁽²⁹⁾

8. Attachment

Pictures from first day of therapy taken before the therapy (09.02.2009)



Picture 1. M.Nasalis



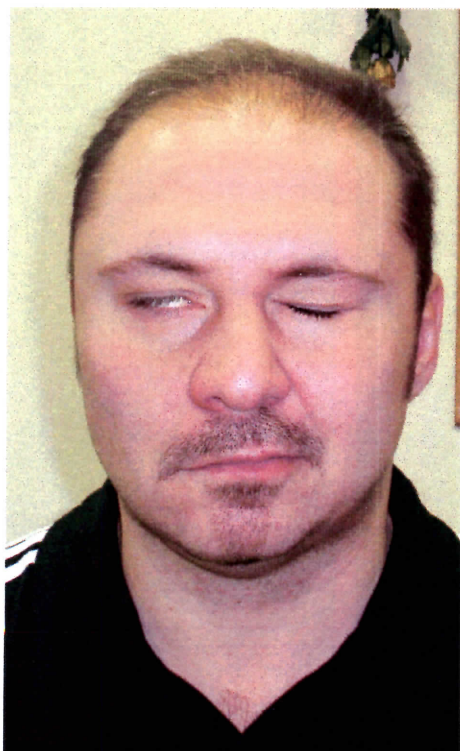
Picture 2. M.Orbicularis Oris



Picture 3. M.Risorius



Picture 4.M. Buccinator



Picture 5.M. Orbicularis oris



Picture 6. M. Corrogator supercili



Picture 7. M. Frontalis



Picture 8. M. Levator agulis oris



Picture 9.M.Mentalis



Picture 10. M.Zygomaticus major

2. Pictures taken before therapy (20.02.2009)



Picture 11. M. Levator anguli oris



Picture 12. M. Frontalis



Picture 13. M. Zygmaticus major



Picture 14. M. Risorius



Picture 15. M. Orbicularis oris



Picture 16. M. Mentalis



Picture 17. M. Orbicularis oculi- orbital part
with firmly closing of eyelid.



Picture 18. M. Orbicularis oculi- palpebral
part with closing gently the eye together.



Picture 19. Voluntary sticking out of tongue



Picture 20. Taping of m. Orbicularis oculi, right side.

Pictures:

1. Pictures from first day of therapy taken before the therapy, 11th February.

Picture 1. M.Nasalis

Picture 2. M.Orbicularis Oris

Picture 3. M.Risorius

Picture 4.M.Buccinator

Picture 5. M.Orbicularis oris

Picture 6. M.Corrogator supercili

Picture 7. M.Frontalis

Picture 8. M.Levator agulis oris

Picture 9.M.Mentalis

Picture 10. M.Zygomaticus major

2. Pictures taken before therapy the last day of therapy, 20th February.

Picture 11. M. Levator anguli oris

Picture 12. M. Frontalis

Picture 13. M. Zygomaticus major

Picture 14. M.Risorius

Picture 15. M. Orbicularis oris

Picture 16. M. Mentalis

Picture 17. M. Orbicualris oculi- orbital part with firmly closing of eyelid

Picture 18. M. Orbicularis oculi- palpebral part with closing gently the eye together.

Picture 19.Voluntary sticking out of tongue

Picture 20. Taping of m. Orbicularis oculi, right side.

All pictures are taken by the author, and used in the thesis with approval from the patient.

8.1. Abbreviations

BMI	Body mass index
C0/C1	The area between occipital bone and cervical vertebrae number one
C-1	Cervical vertebrae nr one- Atlas
C2/3	The area between axis and cervical vertebrae.
C-7	Cervical spine nr 7 or vertebra prominens.
CT	Computed tomography
C/Th crossing	The crossing between cervical spine and thoracic spine.
CN-V	Cranial nerve number five
CN-VI	Cranial nerve number six
CN-VII	Cranial nerve number seven
E.G	Exempli gratia
EMG	Electromyography
FTVS	Fakulta Telesne Vychovy a Sportu
HSV	Herpes simplex virus
MRI	Magnetic resonance imaging
MS	Multiple sclerosis
NET	Nerve excitability test
PCR test	Polymerase chain reaction
UMN	Upper motor nerve
VZV	Varicella zoster virus
X-CN	The tenth cranial nerve, Vagus Nerve



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Application for Ethics Board Review

of the research project, doctoral research, master degree research, undergraduate research, involving human subjects

Project title: Facial nerve paresis

Nature of the research project: Bachelor degree research

Author (chief investigator): Kine Grue

Supervisor (in case of student research): Mgr. Miroslava Jalovcova

Research project description: Facial nerve paresis investigation, daily therapy with evaluation and final conclusion.

Practice took place at: Fakultní nemocnice Kralovské Vinohrady, Neurological Department.

Non- invasive methods will be used and personal data will not be published.

Date: 15.02.2009

Author's signature:

Kine Grue

Faculty of Physical Education and Sport, Charles University in Prague ETHICS BOARD REVIEW

Ethics Board members: Doc. MUDr. Staša Bartůňková, CSc.
Prof. Ing. Václav Bunc, CSc.
Prof. PhDr. Pavel Slepíčka, DrSc.
Doc. MUDr. Jan Heller, CSc.

The Ethics Board at the Faculty of Physical Education and Sport, Charles University, approved the research project.

Approval number: *0283/2009*
Date: *9.3.2009*

The Ethics Board at the Faculty of Physical Education and Sport, Charles University, reviewed the submitted research project and **found no contradictions with valid principles**, regulations and international guidelines for biomedical research involving human subjects.

The chief investigator of the project met the necessary requirements for receiving the Ethics Board approval.

Official school stamp

[Signature]

Signature, REB Chairman

